Update on the “New Scenario Process”

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WCRP/CLIVAR Working Group on Coupled Modeling
NCAR
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The Parallel Process

- Representative concentration pathways
  - Forcing, concentrations, emissions, land use

- Socio-economic pathways
  - Emissions drivers, mitigative capacity
  - Exposure, sensitivity, adaptive capacity

- Earth-system model simulations
  - Climate change, climate variability

- Integrated analyses
  - Mitigation, adaptation, impacts
RCP Special Issue in *Climatic Change* (now available online)

**List of Papers:**
- Overview paper (Van Vuuren et al.)
- RCP 8.5, MESSAGE paper (Riahi et al.)
- RCP 6.0, AIM paper (Masui et al.)
- RCP 4.5, GCAM paper (Thompson et al.)
- RCP 2.6, IMAGE paper (Van Vuuren et al.)
- Land use paper (Hurtt et al.)
- The Emission inventory paper (Granier et al.)
- Atmospheric chemistry paper (Lamarque et al.)
- GHG concentrations and extensions to 2300, the ECPs (Meinshausen et al.)
RCP Database (available on IIASA website)

**Query Results:**

<table>
<thead>
<tr>
<th>Region</th>
<th>Scenario</th>
<th>Variable</th>
<th>Unit</th>
<th>2000</th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
<th>2060</th>
<th>2070</th>
<th>2080</th>
<th>2090</th>
<th>2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>AIM - RCP 6.0</td>
<td>Forcing - Total</td>
<td>W/m²</td>
<td>1.723</td>
<td>1.901</td>
<td>2.089</td>
<td>2.480</td>
<td>2.854</td>
<td>3.146</td>
<td>3.521</td>
<td>3.905</td>
<td>4.443</td>
<td>4.932</td>
<td>5.255</td>
<td>5.481</td>
</tr>
<tr>
<td>World</td>
<td>IMAGE - RCP3-PD (2.6)</td>
<td>Forcing - Total</td>
<td>W/m²</td>
<td>1.723</td>
<td>1.904</td>
<td>2.129</td>
<td>2.584</td>
<td>2.862</td>
<td>2.999</td>
<td>2.998</td>
<td>2.918</td>
<td>2.854</td>
<td>2.808</td>
<td>2.759</td>
<td>2.714</td>
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<tr>
<td>World</td>
<td>MESSAGE - RCP 8.5</td>
<td>Forcing - Total</td>
<td>W/m²</td>
<td>1.723</td>
<td>1.906</td>
<td>2.154</td>
<td>2.665</td>
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<td>3.993</td>
<td>4.762</td>
<td>5.539</td>
<td>6.299</td>
<td>7.020</td>
<td>7.742</td>
<td>8.388</td>
</tr>
</tbody>
</table>

**Output Options:**

- Data Download - Registration

**Notes:**

Total radiative forcing excludes mineral dust and the effect of land albedo.

© 2008, 2009 RCP data comparison
Combining RCPs with socioeconomic scenarios

RCP Replications
   Explore many alternative socioeconomic pathways consistent with particular RCPs

Shared Socioeconomic Pathways (SSPs)
   Develop small number of socioeconomic pathways to facilitate interdisciplinary research and assessment
The Matrix
The Scenario Matrix Architecture

Socio-economic reference pathway

SSP1  SSP2  SSP3  ...

Forcing level (W/m²)

8.5
6.0
4.5
2.6

SSP Logic

Increasing socio-economic challenges for mitigation

SSP 5
SSP 3
SSP 2
SSP 1
SSP 4

Increasing socio-economic challenges for adaptation
Which storylines to choose?

- SSP 5: Coal & gas powered growth
- SSP 3: Fragmented world
- SSP 2: Sustainable development
- SSP 4: Divided in rich & poor

Increasing socio-economic mitigation challenges vs. Increasing socio-economic adaptation challenges
Process

IPCC Expert Meeting, Berlin, November 2010
experiments with SSP conceptualization and model runs
development of scenario information (urbanization projections)

SSP workshop, Korea, July 2011
circulate Framework Paper, August
continued experimentation and development of proposals

IAMC workshop, Austria, October 2011
  – Assemble IAM experiments with SSPs

SSP workshop, NCAR, November 2-4, 2011
  – Adopt “basic” SSPs
  – Prioritize needs for “extended” SSP elements

IPCC Workshop, early/mid 2012?
  – Launch “basic” SSPs
  – Assess progress on “extended” SSPs
Climate Modeling Questions

• How to handle uncertainty in climate change outcomes associated with each RCP?
  – “marker models”?

• How to produce climate outcomes for forcing pathways other than RCPs?
  – What are limits of pattern scaling?
  – How to characterize climate in SSP reference scenarios?

• What forcing scenarios are “consistent with” a given RCP?
  – Shape vs level
  – Short-lived species
  – Land use